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(71) Applicant(s)

CR Elastomere GmbH

(Incorporated in the Federal Republic of Germany)

Postfach 3003 45, 51332, Leverkusen,

Federal Republic of Germany

(72) Inventor(s)

Werner Heini

Siegfried Pietsch

Jürgen Netzer

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(56) Documents Cited

GB 2219050 A

GB 2141205 A

GB 1409266 A

GB 1066857 A

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(74) Agent and/or Address for Service

Boulton Wade Tennant

Verulam Gardens, 70 Gray's Inn Road, London,

WC1X 8BT, United Kingdom

(54) Abstract Title

Seal assembly for a rod

(57) The seal assembly for separating a region at a higher pressure p_1 from a lower pressure region p_2 has a first, elastomeric, sealing element 5 having a sealing lip engaging the surface of a rod 2 and a second, PTFE, sealing element 6 having a substantially rectangular shape in cross-section. The PTFE element 6 has an inclined surface 7 meeting the rod at an angle α and a lubricating pocket 9 is formed between the two sealing elements, improving the friction behaviour of the seal.

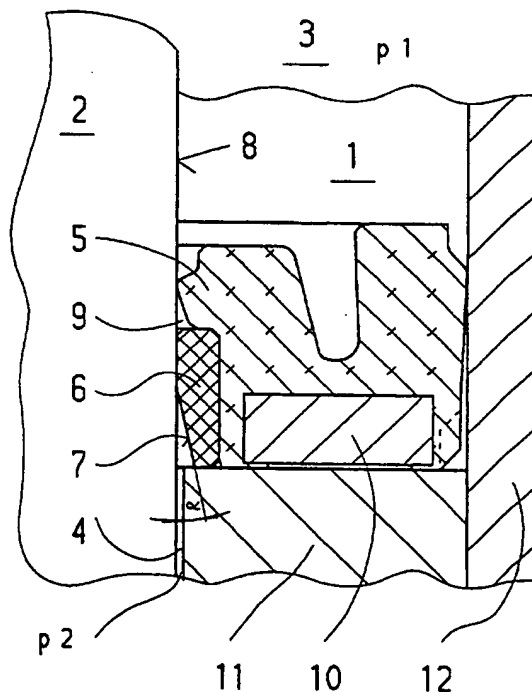


Fig. 1

GB 2 353 336 A

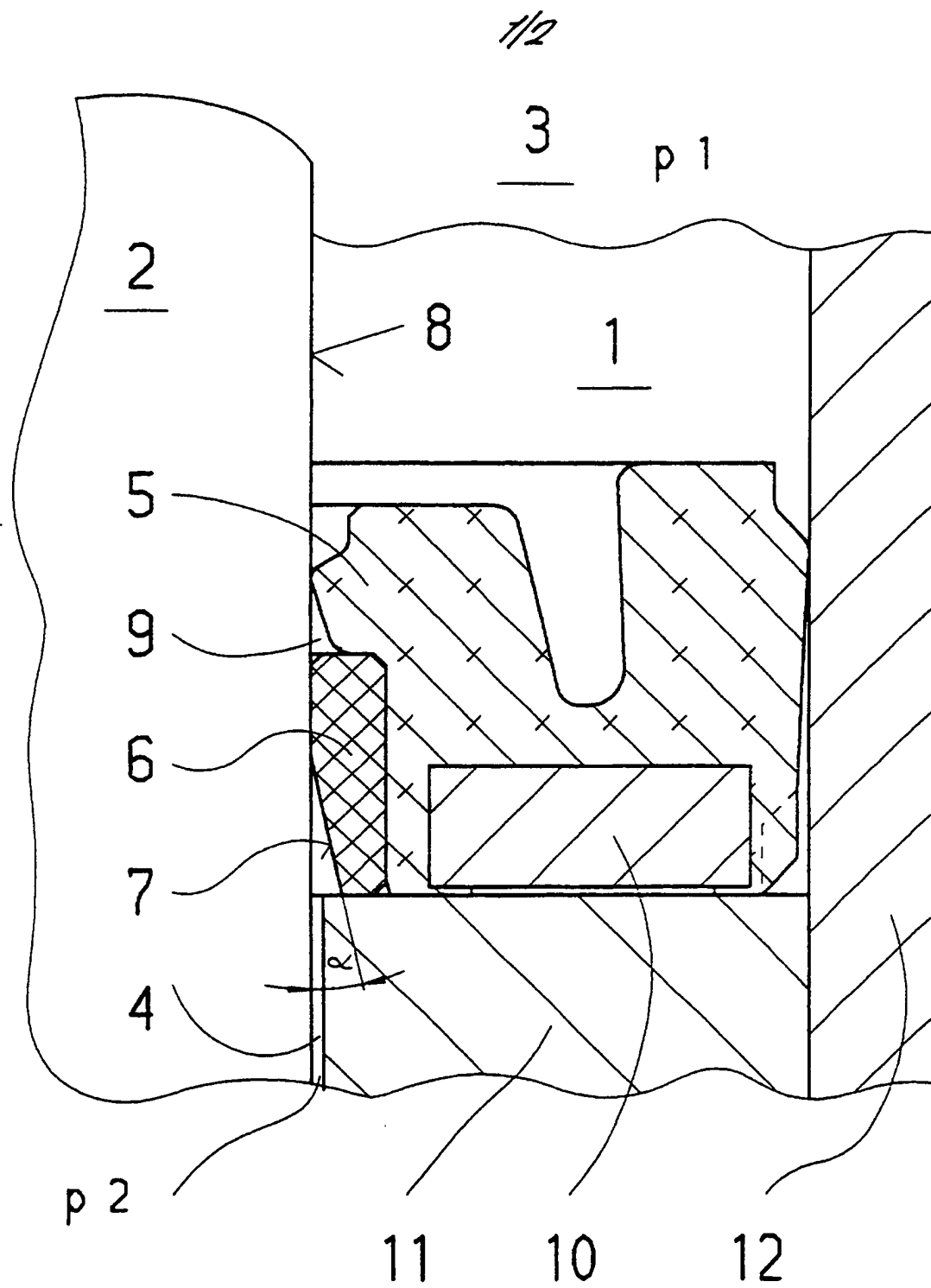


Fig. 1

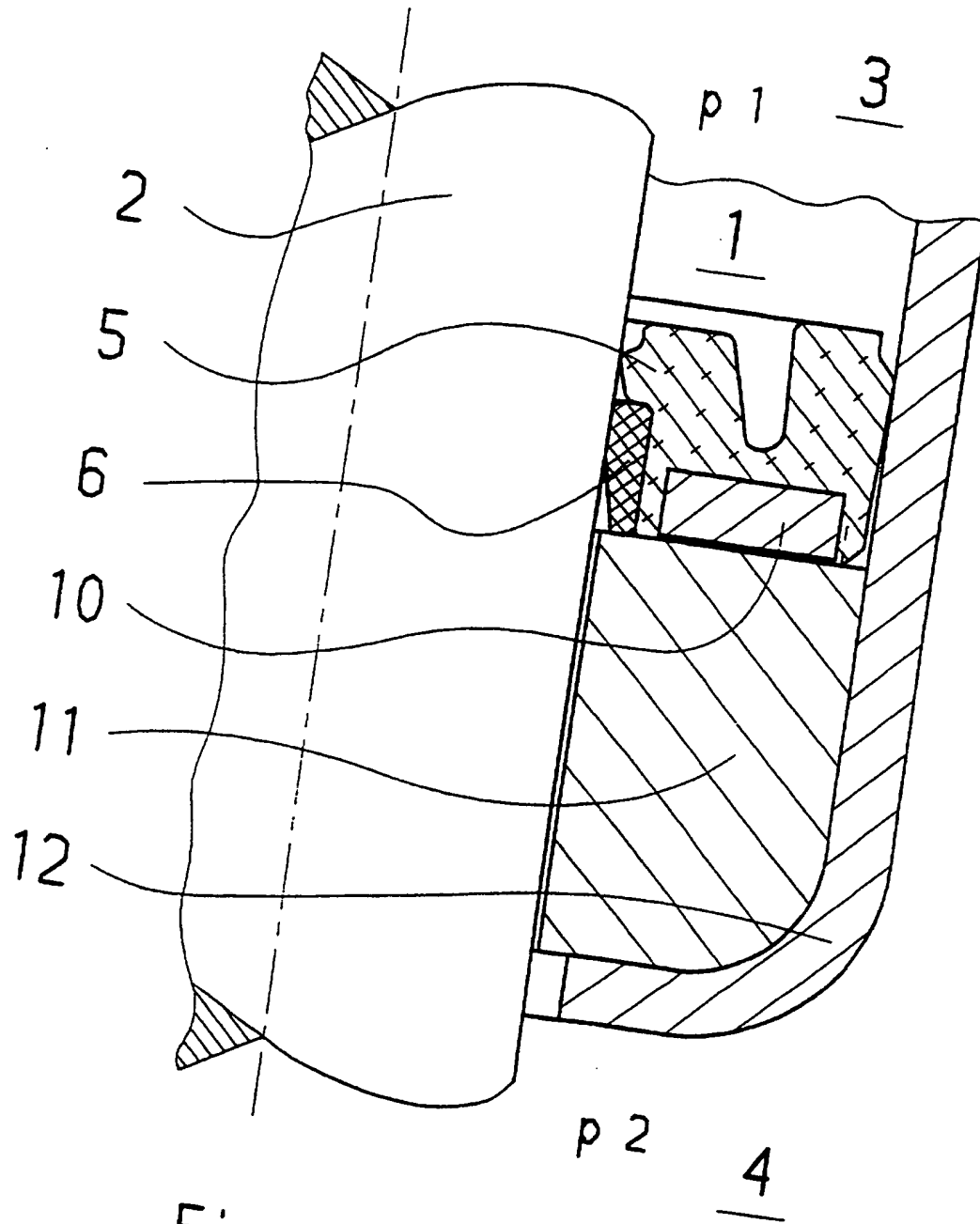


Fig. 2

Sealing assembly for sealing a rod-like element

The invention relates to a sealing assembly for sealing a rod-like element, wherein the sealing assembly maintains a pressure difference which prevails between the two zones which are separated by the sealing assembly.

Sealing assemblies of the type defined have been known for a long time and are often called gas spring seals. They have the purpose of sealing a guided and sealed rod in such a way that a pressure difference can be maintained between the two sides of the seal.

In most instances involving a gas spring seal an elastomeric sealing lip is used which is intended to achieve the desired effect, i.e. maintaining a pressure difference. However, known sealing assemblies of this type have the disadvantage that, depending on the gas spring pressure, the breakaway force and friction can attain very high values which can be harmful.

Therefore, the object of the invention is to develop a sealing assembly of the type defined, in such a way that the breakaway force and friction values of the assembly remain low even if the pressure differences to be maintained are high.

The invention therefore provides a sealing assembly for sealing a rod-like element, wherein the sealing assembly maintains a pressure difference which prevails between two areas which areas are separated by the sealing assembly, wherein a first sealing element in the form of a sealing lip of elastomeric material which sealingly abuts against the rod-like element, and a second sealing element in the form of a seal made of polytetrafluoroethylene (PTFE), wherein the second sealing element is of substantially rectangular shape in cross-section.

Preferably, the first sealing element faces that zone in which the higher pressure prevails. Furthermore, the second

sealing element is preferably arranged in the immediate vicinity of the first sealing element.

According to the invention, therefore, instead of the known conventional elastomeric sealing lip a two-component design for the sealing assembly is proposed. Furthermore, an elastomeric sealing lip is provided on the front side thereof, facing the pressure zone. In operation, this lip is lubricated very satisfactorily by the upstream oil cushion which builds up and, at the same time, it has very good sealing properties against the gas pressure, as a result of its high degree of elasticity and low set behaviour. According to the invention, a second sealing location, which is made of PTFE material, is provided downstream of the elastomeric sealing lip. Boundary friction prevails for the most part in this zone of the gas spring seal so that the very good sliding friction properties of the PTFE material are utilised. At the same time, the contact pressure on the material is distinctly lower here than in the front zone of the seal, i.e. in the vicinity of the elastomeric sealing lip, so that the creep tendency of the PTFE material under high pressure loading does not have any appreciable relevance.

In a further embodiment, it is provided that the surface of the second sealing element facing the rod-like element is arranged at least partly at an angle (α) to the surface of the rod-like element. This angle (α) may be between 0.5° and 30° .

The sealing assembly according to the invention performs particularly well if a lubricant pocket is provided between the first sealing element and the second sealing element. A further reduction in friction can be achieved by the use of this lubricant pocket.

One example of an embodiment of the sealing assembly is illustrated in the drawings, in which:-

Figure 1 shows in detail a section through the sealing assembly and the contact relationships with a rod-like element to be sealed, and

Figure 2 shows the entire seal in its mounted position.

According to Figure 1, the sealing assembly 1 abuts with friction against a rod-like element 2 and seals it. In the upper zone 3 of the rod-like element 2 a higher pressure p_1 prevails than in the lower zone 4, where the pressure p_2 is lower. Consequently, the sealing assembly 1 seals the rod-like element 2 with respect to the pressure difference $\Delta p = p_1 - p_2$.

For this purpose, the sealing assembly 1 comprises, in a known manner, a first sealing element 5 in the form of an elastomeric sealing lip. However, a second sealing element 6 of polytetrafluoroethylene (PTFE) is disposed downstream of the first sealing element in spatial proximity thereto. As is clearly evident from Figure 1, the PTFE seal 6 is of substantially rectangular shape in cross-section, even if the seal is slightly distorted whereby one portion of the seal 6 can be flattened by an angle α . The sealing element 6 is located in its axial position by a piston guide element 11, on one side, and by the elastomeric sealing lip 5, on the other side.

In this case the surface 7 of the second sealing element, which faces the rod-like element 2, is partly flattened by the angle α relative to the surface 8 of the rod-like element 2. Especially good lubricating conditions can thereby be achieved.

The lubricating conditions are also improved in particular by providing a lubricant pocket 9 between the elastomeric sealing lip 5 and the PTFE seal 6; a further reduction in the friction between the sealing assembly 1 and the rod-like element 2 can be achieved thereby. In particular, a further reduction in friction can be obtained as a result of the lubricant pocket 9 which, after a number of strokes, is

partly filled with the oil remaining in the surface roughness of the piston rod element.

The proposed design of a sealing assembly makes it possible to provide a composite seal which is optimised with respect to friction. The sealing assembly is of compact construction and, therefore, is suitable for long-term stable use.

As is evident from Figure 2, the entire sealing assembly can be mounted in a tubular element 12 which effects satisfactory location of the sealing assembly 1 relative to the rod-like element 2. The sealing assembly 1 itself is stabilised by a reinforcing element 10 which, in the example of embodiment, is disposed within the elastomeric material of the first sealing element 5.

Claims

1. A sealing assembly for sealing a rod-like element, wherein the sealing assembly maintains a pressure difference which prevails between two areas which areas are separated by the sealing assembly, wherein a first sealing element in the form of a sealing lip of elastomeric material which sealingly abuts against the rod-like element, and a second sealing element in the form of a seal made of polytetrafluoroethylene (PTFE), wherein the second sealing element is of substantially rectangular shape in cross-section.
2. A sealing assembly according to Claim 1, wherein the first sealing element faces that zone in which the higher pressure prevails.
3. A sealing assembly according to Claim 1 or 2, wherein the second sealing element is arranged in the immediate vicinity of the first sealing element.
4. A sealing assembly according to any one of Claims 1 to 3, wherein the surface of the second sealing element facing the rod-like element is arranged at least partly at an angle (α) to the surface of the rod-like element.
5. A sealing assembly according to Claim 4, wherein the angle (α) is between 0.5° and 30° .
6. A sealing assembly according to any one of Claims 1 to 5, wherein a lubricant pocket is provided between the first sealing element and the second sealing element.
7. A sealing assembly substantially as hereinbefore described with reference to or as shown in the accompanying drawings.



Application No: GB 0020205.1
Claims searched: 1 - 6

Examiner: Tom Sutherland
Date of search: 14 December 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.R): F2B

Int CI (Ed.7): F16J 15/16, 15/32, 15/56

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2219050 A (MAGNAGHI) See the Fig., seal 8.	1 - 3
X	GB 2141205 A (GREENE TWEED) See the Figs and page 2 lines 33 - 37.	1 - 5
X	GB 1409266 (WALKER) See page 2 lines 9 to 11.	1 - 3
X	GB 1066857 (MANVILLE) See Figs 2, 3 and 5 and page 2 line 121 to page 3 line 10.	1 - 4

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.